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(54) **Color contact image sensor**

Kontaktfarbbildsensor

Capteur d'image en couleurs à contact

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Description

BACKGROUND OF THE INVENTION

The present invention relates to a contact image sensor for sensing characters, diagrams and drawings on a document, and more particularly to a color contact image sensor which can sense and transmit characters, diagrams, and drawings of a colored document.

Generally, a contact image sensor (hereinafter referred to as "CIS") is utilized in a facsimile to sense the shapes and gray levels of characters, diagrams, and drawings on a document to be transmitted or in a hand scanner, a peripheral equipment of a personal computer, to sense the shapes and gray levels of the images on a document to be processed by the personal computer. However, the conventional CIS has a problem in that it can sense a black/white document, but not a colored document. This problem is described with reference to the attached drawings as follows.

With reference to FIG.1, a conventional CIS comprising m sensing portions B1 to Bm connected commonly to n data lines DL1 to DLn and respectively to m address lines AD1 to ADm is described. The m sensing portions B1 to Bm are composed of n dot cells DS11 to DSmn, each of which is composed of one of photodiodes PD11 to PDmn and one thin film transistor (hereinafter referred to as "TFT"). The anodes of the photodiodes PD11 to PDmn are commonly connected to a reverse bias voltage source 14 and the source terminals of the TFTs Q11 to Qmn are respectively connected to the cathodes of the photodiodes PD11 to PDmn. The drain terminals of the TFTs Q11 to Q1n within a first sensing portion B1 are respectively connected to n data lines DL1 to DLn, and the gate terminals of the TFTs Q11 to Q1n within the first sensing portion B1 are commonly connected to a first address line AD1. Also, the drain terminals of the TFTs Qm1 to Qmn within the m'th sensing portion Bm are respectively connected to n data lines DL1 to DLn, and the gates of the TFTs Qm1 to Qmn within the m'th sensing portion Bm are commonly connected to the m'th address line ADm.

The CIS additionally comprises a driving portion 10 connected to the first-to-m'th address lines AD1 to ADm, and a signal outputting portion 12 connected to the first-to-n'th data lines DL1 to DLn. The driving portion 10 sequentially drives the first-to m'th sensing portions B1 to Bm through the first-to-m'th address lines AD1 to ADm, thereby sequentially supplying the outputs of the first-to-m'th sensing portions B1 to Bm to the signal outputting portion 12. And, the signal outputting portion 12 transmits the sequentially received outputs of the first-to-m'th sensing portions B1 to Bm to a signal processing portion (not shown).

Meanwhile, the photodiodes PD11 to PDmn within the first-to m'th sensing portions B1 to Bm generate a current corresponding to the optical density from an incident light source (not shown) reflected by a document, and store the generated current in the internal capacitor (not shown). And, the TFTs Q11 to Qmn transmit the current stored in the photodiodes PD11 to PDmn to the signal outputting portion 12, when a driving signal is supplied from the driving portion 10 to their gates. In detail, the n TFTs Q11 to Q1n of the first sensing portion B1 transmit the current stored in the photodiodes PD11 to PD1n to the signal outputting portion 12, when a driving signal is supplied from the driving portion 10 through the first address line AD1. And, the n TFTs Qm1 to Qmn of the m'th sensing portion Bm transmit the current stored in the photodiodes PDm1 to PDmn to the signal outputting portion 12, when a driving signal is supplied from the driving portion 10 through the m'th address line ADm. Then, the signal outputting portion 12 converts the current generated by the photodiodes PD11 to PDmn into digital data. The digital data has different logic values according to the amount of current generated by the photodiodes PD11 to PDmn. The amount of current generated in the photodiodes PD11 to PDmn varies according to the gray levels of the characters, diagrams, and drawings in a document.

FIG.2 shows a layout of the first-to-third dot cells DS11 to DS13 of the first sensing portion B1 which is a part of CIS. With reference to FIG.2, the first-to-third photodiodes PD11 to PD13, whose anodes are connected to the reverse bias voltage line 14, are horizontally arranged in parallel. The first-to-third TFTs Q11 to Q13, whose source electrodes are connected to the cathodes of the diodes PD11 to PD13, respectively, are arranged in parallel with the first-to-third photodiodes PD11 to PD13. For the first-to third photodiodes PD11 to PD13 to maintain a relatively large light receiving area for one point of a document, their vertical axis length is longer than their horizontal axis length. And, the gates of the first-to-third TFTs Q11 to Q13 are commonly connected to the first address line AD1 and the drain electrodes of the first-to third TFTs Q11 to Q13 are respectively connected to the first-to third data lines DL1 to DL3.

FIG.3 is a cross sectional view taken on line A-A' of the first-to-third photodiodes PDll to PD13 shown in FIG. 2. In FIG.3, a CIS comprising a substrate 20 coated with an insulating film made of SiN is described. A plurality of metallic electrodes 22 made of chromium Cr are deposited on the insulating film 21. Light-receiving material layers 23 and transparent electrodes 24 are laminated on the plurality of metallic electrodes 22. The light receiving material layer 23 is made of amorphous silicon. A protecting film 25 made of polyimide is deposited on the insulating film 21 and the transparent electrode 24.

As described above, since the conventional CIS is formed to be able to sense and process the gray level of characters, diagrams or drawings on a document, it can process documents having black and white information, but not a colored document.

EP-A-0 145 199 discloses a color CIS in which pixel electrodes for the different colors are provided in a matrix array. The pixel electrodes are linearly provided in a

main scanning direction, and also linearly provided in a perpendicular subscanning direction. Corresponding color filters are superimposed to the pixel electrodes. In this document, the neighbouring green, blue and red pixel electrodes are aligned.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a color CIS which can sense and process a colored document. It is another object of the present invention to provide provide a method of manufacturing the color CIS.

To achieve the first object, the color CIS of the present invention comprises the features of claim 1. A color CIS may comprise

a sensing cell array composed of unit cells having red, green and blue color sensing elements for sensing red, green and blue color components of color information printed on a point of a document, and three controlling switch elements respectively connected to the sensing elements, for selectively outputting the outputs of the red, green and blue color sensing elements;
an outputting means for processing the red, green and blue color component sensing signal from the unit cells of the sensing cell array, to be digital data; and
a driving means for driving the controlling switches according to the color component of the color component sensing elements.

To achieve the second object of the present invention, the color CIS manufacturing method of the present invention comprises the steps of claim 12. A CIS manufacturing method may comprise:

providing a substrate;
forming a plurality of photodiodes where a plurality of anode electrodes, light-receiving material layers and transparent electrodes are laminated, and a plurality of thin film transistors for driving the photodiodes, on the substrate;
forming an insulating film on the transparent electrode;
forming passing holes on the insulating film and forming wires for respectively connecting the plurality of transparent electrodes to the source electrodes of the plural thin film transistors through the passing holes;
coating a protecting film on the wires and insulating film; and
forming filters by dyeing regions of the protecting film where the transparent electrodes are formed, into red, green and blue colors.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and other advantages of the present invention will become more apparent by describing the preferred embodiment of the present invention with reference to the attached drawings, in which:

FIG.1 shows an equivalent circuit of a conventional CIS;
FIG.2 shows a layout of first-to-third dot cells of the first sensing portion shown in FIG.1;
FIG.3 is a sectional view of the first-to-third photodiodes shown in FIG.2;
FIG.4 shows an equivalent circuit of a color CIS according to an embodiment of the present invention;
FIG.5 is a layout showing a part of the first sensing portion shown in FIG.4; and
FIG.6 is a sectional view of the photodiodes shown in FIG.5.

DETAILED DESCRIPTION OF THE INVENTION

With reference to FIG.4, a color CIS according to an embodiment of the present invention, comprising m sensing portions B1 to Bm is described. The m sensing portions B1 to Bm are composed of n dot cells DS11 to DSmn for sensing n color information printed on n points of a document. The dot cells DS11 to DSmn comprise photodiodes RPDll to RPDmn for red color, photodiodes GPD11 to GPDmn for green color, and photodiodes BPD11 to BPDmn for blue color, each anode of which is connected to a reverse bias voltage line 34, and TFTs RQ11 to RQmn, GQ11 to GQmn, and BQ11 to BQmn for red color, green color, and blue color, the sources of which are connected to the cathodes of red color, green color, and blue color photodiodes RPD11 to RPDmn, GPD11 to GPDmn and BPD11 to BPDmn, respectively. The drain electrodes of red color, green color, and blue color transistors RQ11 to RQmn, GQ11 to GQmn, and BQ11 to BQmn of the respective dot cells DS11 to DSmn are connected to each other in each dot cell. And, the gates of the red color TFTs RQ11 to RQmn, classified by sensing portions B1 to Bm, are commonly connected to the first-to-m'th red color address lines ADR1 to ADRm, respectively. In more detail, the gates of the red color TFTs RQ11 to RQ1n within the first sensing portion Bl are commonly connected to the first red color address line ADR1, and the gate electrodes of the red color TFTs RQm1 to RQmn within the m'th sensing portion Bm are commonly connected to the m'th red color address line ADRm. As described above, the red color TFTs RQ21 to RQ(m-1)n within the second-to-m-1'th sensing portions B2 to Bm-1 are commonly connected to the second-to-m-1'th red color address lines ADR2 to ADRm-1 corresponding to each sensing portion. By the same way as the gates of the red color TFTs RQ11 to RQmn, the gates of green color TFTs GQ11 to GQmn and the gates of blue color TFTs BQ11 to BQmn are commonly

connected to the green color address lines ADG1 to ADGm and the blue color address lines ADB1 to ADBm, respectively, corresponding to each sensing portion. The drain electrodes of red, green and blue color TFTs RQ11 to RQmn, GQ11 to GQmn, and BQ11 to BQmn within the respective sensing portions Bl to Bm are commonly connected to the data lines DL1 to DLn, corresponding to each dot cell. In detail, the drain electrodes of red color TFTs RQ11, RQ21, RQ31,....., RQm1, green color TFTs GQ11, GQ21, GQ31, ..., GQm1, and blue color TFTs BQ11, BQ21, BQ31, ..., BQm1 in the first dot cells DS11, DS21, DS31, ..., DSm1 of the first-to-m'th sensing portions B1 to Bm are commonly connected to the first data line DL1, and the drain electrodes of red color TFTs RQ1n, RQ2n, RQ3n, ..., RQmn, green color TFTs GQ1n, GQ2n, GQ3n, ..., GQmn, and blue color TFTs BQ1n, BQ2n, BQ3n, ..., BQmn in the n'th dot cells DS1n, DS2n, DS3n, ..., RQmn of the first-to-m'th sensing portions B1 to Bm are commonly connected to the n'th data line DLn. As the same way, the drain electrodes of red color TFTs RQ12 to RQ1(n-1), RQ22 to RQ2(n-1), ..., RQm2 to RQm(n-1), green color TFTs GQ12 to GQ1(n-1), GQ22 to GQ2(n-1), ..., GQm2 to GQm(n-1) and blue color TFTs BQ12 to BQ1 (n-1), BQ22 to BQ2(n-1), ..., BQm2 to BQm(n-1) in the second to n-1 dot cells DS12 to DS1(n-1), DS22 to DS2 (n-1), ..., DSm2 to DSm(n-1) of the first-to-m'th sensing portions B1 to Bm are commonly connected to the corresponding data lines DL2 to DL(n-1) according to the respective dot cell.

The color CIS additionally comprises a signal outputting portion 32 connected to the first to n'th data lines DL1 to DLn and a driving portion 30 connected to the address lines ADR1 to ADRm, ADG1 to ADGm and ADB1 to ADBm. The signal outputting portion 32 sequentially receives the red, green and blue color component signals sensed by the first-to-m'th sensing portions B1 to Bm, converts the sequentially received signal into digital data, and transmits it to a signal processing portion (not shown). The driving portion 30 supplies signals of high logic state to the gates of the TFTs RQ11 to RQmn, GQ11 to GQmn, and BQ11 to BQmn through the address lines ADR1 to ADRm, ADG1 to ADGm and ADB1 to ADBm, according to the sensing portion and the component to be sensed, thereby having the red color component signals sensed by the red color photodiodes RQ11 to RQmn, the green color component signals sensed by the green color photodiodes GQ11 to GQmn, and the blue color component signals sensed by the blue color photodiodes BQ11 to BQmn be transmitted sequentially according to the sensing portion to the signal outputting portion 32 through the data lines DL1 to DLn. Meanwhile, the red color photodiodes RPD11 to RPDmn, the green color photodiodes GPD11 to GPDmn and the blue color photodiodes BPD11 to BPDmn generate a current corresponding to the optical density from the incident light source reflected by a document and store the generated current in the internal capacitor (not shown). The red color TFTs RQ11 to RQmn, green color TFTs GQ11 to GQmn, and blue color TFTs BQ11 to BQmn transmit the current signals stored in the red color photodiodes RPD11 to RPDmn, green color photodiodes GPD11 to GPDmn, and blue color photodiodes BPD11 to BPDmn to the signal outputting portion 32, when driving signals of high logic state are supplied to their respective gate electrodes according to each sensing portion. Then, the signal outputting portion 32 converts the sensed red, green, and blue color component signals supplied sequentially according to the color component and the sensing portion from the first-to-m'th sensing portions B1 to Bm into digital data, and supplies the converted red, green and blue color component data to the signal processing portion.

FIG.5 illustrates a first sensing portion B1 shown in FIG.4, which comprises red, green and blue color photodiodes RPD11, RPD12, GPD11, GPD12, BPD11 and BPD12, alternately arranged in two rows. The red color photodiode RPD11, green color photodiode GPD11, and blue color photodiode BPD11 are arranged to form a triangle, thereby forming a color sensing element of the first dot cell DS11 for sensing color information printed on one point of a document. The red color photodiode RPD12, green color photodiode GPD12, and blue color photodiode BPD12 are arranged to form a reverse triangle, thereby forming a color sensing element of the second dot cell DS12. The anodes (lower electrodes) of red, green and blue color photodiodes RPD11, RPD12, GPD11, GPD12, BPD11, and BPD12 of the first and second dot cells DS11 and DS12 are connected to a reverse bias voltage line 34. Among them, the photodiodes RPD11, GPD11, and BPD12 arranged in the lower row are connected to the reverse bias voltage line 34 by wires formed between the photodiodes BPD11, RPD12, and GPD12 of the upper row.

The first sensing portion B1 comprises TFTs RQ11, RQ12, BQ11, BQ12, GQ11, and GQ12 arranged in three rows. The gate electrodes of the first-row red color TFTs RQ11 and RQ12, the gate electrodes of the second-row blue color TFTs BQ11 and BQ12, and the gate electrodes of the third-row green color TFTs GQ11 and GQ12 are connected to a first red color address line ADR1, a first blue color address line ADB1, and a first green color address line ADG1, respectively. The source electrodes of the TFTs RQ11, RQ12, GQ11, GQ12, BQ11, and BQ12 are connected to the cathodes (upper electrodes) of the photodiodes RPD11, RPD12, GPD11, GPD12, BPD11 and BPD12, and among them, the source electrodes of the TFTs BQ11, RQ12, and GQ12 are connected by wires between the lower photodiodes RPD11, GPD12 and BPD12. The TFTs RQ11, GQ11, and BQ11 whose drain electrodes are commonly connected to the first data line DL1 form a first dot cell DS11 together with the photodiodes RPD11, GPD11 and BPD11, and the TFTs RP12, GP12 and BP12 whose drain electrodes are commonly connected to the second data line DL2 form a second dot cell DS12 together with

the three photodiodes RPD12, GPD12 and BPD12.

FIG.6 illustrates a sectional view taken on line A'-A of the photodiodes RPD11 and GPD12, and BPD12 shown in FIG.5. FIG.6 shows a substrate 40 on which an insulating film 41 made of silicon nitride is coated. The substrate 40 is made of glass. A plurality of anode electrodes 42 and connecting wires 43 arranged in a horizontal axis are formed on the insulating film 41. The anode electrodes 42 and connecting wires 43 are patterned by depositing a metallic material and photo-etching the deposited metallic material. A light receiving material 44 made of amorphous silicon is laminated on the anode electrode. A transparent electrode 45, a cathode electrode made of ITO, is formed on the light-receiving material layer 44. The light-receiving material layers 44 and the transparent electrodes 45 are patterned by photo-etching. An insulating film (not shown) made of silicon nitride is coated on the transparent electrodes 45, and wires (not shown) connecting the transparent electrodes 45 to TFTs (not shown) by passing through the insulating film are formed. A protecting film 46 made of polyimide is coated on the wires and insulating film. The parts of protecting film 46, where the transparent electrodes 45 are disposed, are dyed into red, green and blue colors, thereby forming red, green and blue color filters (47, 48 and 49). The red, green and blue color filters 47, 48, and 49 are disposed to form a triangle.

As described above, since the dot cell of CIS has red, green and blue color photodiodes, the present invention has an advantage of providing a color CIS which can sense color information printed on a point of a document.

Claims

1. A color contact image sensor comprising:

   a dot cell array composed of dot cells (DS11-DSmn) having sensing (BPD, RPD, GPD) and switching (RQ, BQ, GQ) elements;
   a signal outputting means (32) for sensing signals supplied from dot cells (DS11-DSmn) of said dot cell array, to be digital data; and
   a driving means (30) for driving said controlling switch elements,

   characterised in that

   each dot cell (DS11-DSmn) has red (RPD11-RDPmn), green (GPD11-GDPmn) and blue (BPD11-BDPmn) color sensing elements for sensing red, green, and blue color components of color information printed on a point of a document, and three controlling switch elements (RQ11, GQ11, BQ11 - RQmn, GQmn, BQmn) respectively connected to said sensing elements, for selectively outputting outputs of said red, green and blue color sensing elements;
   said red, green and blue color sensing elements of each dot cell form a triangle, the triangle of one cell being reverse with respect to the triangle of a neighbouring cell;
   said signal outputting means (32) processes red, green and blue color component sensing signals supplied from dot cells of said dot cell array, to be digital data; and
   said driving means (30) drives said controlling switch elements (RQ11-RQmn, GQ11-GQmn, BQ11-BQmn) according to a color component of the color component sensing elements.

2. A color contact image sensor as claimed in claim 1, wherein outputs of the three controlling switch elements (RQ11, GQ11, BQ11 - RQmn, GQmn, BQmn) of each cell are commonly connected to a data line (DL1-DLn) to the said signal outputting means (32).

3. A color contact image sensor as claimed in claim 1 or 2, wherein said red, green and blue color sensing elements (RAD11-RDPmn, GPD11-GDPmn, BPD11-BDPmn) are arranged in two rows.

4. A color contact image sensor as claimed in Claim 1, 2 or 3, wherein said sensing elements (RPD11-RDPmn, GPD11-GDPmn, BPD11-BDPmn) are made of photodiodes.

5. A color contact image sensor as claimed in Claim 3 or 4, wherein outputs of said upper-row sensing elements (BPD11, RPD12, GPD12) are transmitted to said controlling switch elements (BQ11, RQ12, GQ12) through wires formed between said lower-row arranged sensing elements (RAD11, GPD11, BPD12).

6. A color contact image sensor as claimed in one of claims 1 to 5, wherein said controlling switch elements (RQ11-RQmn, GQ11-Gomn, BQ11-BQmn) are made of thin film transistors.

7. A color contact image sensor as claimed in claim 6, wherein said drain electrodes of said thin film transistors (RQ11-RQmn, GQ11-GQmn, BQ11-BQmn) of one dot cell are commonly connected to a data line (DL1-DLn) to the said signal outputting means (32).

8. A color contact image sensor as claimed in one of claims 1 to 7, comprising

   a linear dot cell array composed of dot cells (DS11-DSmn) each having red (RPD11-RDPmn), green (GPD11-GDPmn), and blue (BPD11-BDPmn) color sensing elements ar-

ranged in two rows, forming a triangle for sensing red, green, and blue color components of color information printed on a point of a document, and thin film transistor switch elements (RQ11, GQ11, BQ11 - RQmn, GQmn, BQmn) respectively connected to said sensing elements, one for each of said sensing elements, for selectively switching said sensing elements and outputting outputs of said red, green, and blue color sensing elements, each of said switch elements having gate, drain, and source electrodes, and wherein said dot cell array is divided into m groups of n dot cells;
a plurality of gate lines (ADR1, ADB1, ADG1 - ADRm, ADBm, ADGm) connected to said gate electrodes of said thin film transistor switch elements that are connected to said sensing element of the same color in said group, respectively;
a plurality of drain lines (DL1 - DLn) connected to said drain electrodes of said thin film transistor switch elements, each of said drain lines consisting of three of said red, green, and blue sensing elements and being commonly used in each of said groups;
a driving means (30) for driving said thin film transistor switching elements sequentially, said gate lines (ADR1, ADB1, ADG1 - ADRm, ADBm, ADGm) being connected to said driving means; and
signal outputting means (32) for reading a signal from said drain electrodes, said drain lines (DL1 - DLn) being connected to said signal outputting means.

9. A color contact image sensor as claimed in Claim 8, wherein said sensing elements are made of photodiodes.

10. A color contact image sensor as claimed in Claim 8 or 9, wherein said source electrodes of said thin film transistor switch elements (RQ11-RQmn, GQ11-GQmn, BQ11-BQmn) are connected to said photodiodes (RPD11-RDPmn, GPD11-GDPmn, BPD11-BDPmn) respectively.

11. A color contact image sensor as claimed in Claim 10, wherein said two rows of dot cells comprise upper-row photodiodes and lower-row photodiodes, wherein said upper-row photodiodes (BPD11, RPD12, GPD12) are connected to said source electrodes of said thin film transistor switch elements (BQ11, RQ12, GQ12) by lines formed between said lower-row photodiodes (RAD11, GPD11, BPD12).

12. A method of manufacturing a color contact image sensor comprising the steps of:

providing a substrate (40);
forming a plurality of photodiodes (BPD, RPD, GPD) on which a plurality of anode electrodes (42), light-receiving material layers (44) and transparent electrodes (45) are laminated, and a plurality of thin film transistors (RQ, BQ, GQ) for driving said photodiodes, on said substrate;
forming an insulating film on said transparent electrodes (45) ;
forming passing holes on said insulating film (45), and forming wires for respectively connecting said plurality of transparent electrodes (45) to the source electrodes of said plurality of thin film transistors through said passing holes;
coating a protecting film (46) on said wire and insulating film;

characterised by forming red, green and blue filters (47,48,49) by dyeing regions of said protecting film (46) where said transparent electrodes (45) are disposed, into red, green and blue colors;

in that said photodiodes are alternately arranged in two rows;
in that the photodiodes for the red color (RPD11), the green color (GPD11), and the blue color (BPD11) of one dot cell form a triangle, the photodiodes for the red color (RPD12) , the green color (GPD12), and the blue color (BPD12) of one neighbouring dot cell forming a reverse triangle;
and in that said red, green and blue color filters are arranged to form a triangle, the triangle formed by red, green and blue color filters being reversed with respect to the triangle formed by neighbouring red, green and blue color filters.

13. A method as claimed in Claim 12, wherein said wires for connecting the transparent electrodes of said upper-row arranged photodiodes to said thin film transistors are disposed between the transparent electrodes of said lower-row arranged photodiodes.

14. A method as claimed in Claim 12 or 13, wherein said light receiving material is made of amorphous silicon.

15. A method as claimed in one of claims 12 to 14, comprising the steps of:

providing a glass substrate (40);
forming an image sensing device comprising a linear dot cell array having a plurality of dot cells (DS11 - DSmn) arranged linearly, each cell having red (RPD11 - RPDmn), green (GPD11 - GPDmn), and blue (BPD11 - BPDmn) color sensing elements arranged in two rows, forming a

triangle, each sensing element including a photodiode, and a plurality of thin film transistors (RQ11, GQ11, BQ11 - RQmn, GQmn, BQmn) for driving said photodiodes, one for each photodiode, on said substrate;
forming a polyimide passivation film (46) on entire surface of said image sensing device; and forming red, green, and blue filters by dyeing regions (47, 48, 49) of said polyimide passivation film where said transparent electrodes are disposed, into red, green, and blue colors.

Patentansprüche

1. Ein Kontaktfarbbildsensor, umfassend:

eine Punktzellenanordnung, die aus Punktzellen zusammengesetzt ist (DS11-DSmn), und die Sensorelemente (BPD, RPD, GPD) und Schaltelemente (RQ, BQ, GQ) aufweist;
eine Signalausgabeeinrichtung (32), zum Verarbeiten der von den Punktzellen (DS11-DSmm) ausgegebenen Signale zu digitalen Daten; und
Ansteuereinrichtung (30), um die steuernden Schaltelemente anzusteuern,

gekennzeichnet dadurch, daß

- jede Punktzelle (DS11-DSmn) rote (RPD11-RPDmn), grüne (GPD11-GPDmn) und blaue (BPD11-BPDmn) Farbsensor-elemente zum Wahrnehmen von roten, grünen und blauen Farbkomponenten einer auf einem Punkt eines Dokumentes gedruckten Farbinformation aufweist, und drei steuernden Schaltelementen (RQ11,GQ11,BQ11-RQmn,GQmn,BQmn), die jeweils mit den Sensorelementen verbunden sind, zur selektiven Ausgabe der Ausgangssignale der roten, grünen und blauen Farbsensorelemente;
- die roten, grünen und blauen Farbsensorelemente jeder Punktzelle ein Dreieck bilden, wobei das Dreieck einer Zelle gegenüber dem Dreieck einer Nachbarzelle invers ist;
- die Signalausgabeeinrichtung (32) die von den Punktzellen der Punktzellenanordnung ausgesandten Wahrnehmungssignale für die roten, grünen und blauen Farbkomponenten zu digitalen Daten verarbeitet; und
- das Ansteuereinrichtung (30) die steuernden Schaltelemente (RQ11-RQmn,GQ11-GQmn, BQ11-BQmn) je nach Farbkomponente der die Farbkomponenten wahrnehmenden Elemente ansteuert.

2. Ein Kontaktfarbbildsensor gemäß Anspruch 1, in dem die Ausgänge der drei steuernden Schaltelemente (RQ11,GQ11,BQ11-RQmn,GQmn,BQmn) von jeder Zelle gemeinsam über eine Datenlinie (DL1-DLn) mit der Signalausgabeeinrichtung (32) verbunden sind.

3. Ein Kontaktfarbbildsensor gemäß Anspruch 1 oder 2, in dem die roten. grünen und blauen Farbsensorelemente (RPD11-RPDmn,GPD11-GPDmn, BPD11-BPDmn) in zwei Reihen angeordnet sind.

4. Ein Kontaktfarbbildsensor gemäß Anspruch 1, 2 oder 3, in dem die Sensorelemente (RPD11-RPDmn,GPD11-GPDmn,BPD11-BPDmn) aus Photodioden bestehen.

5. Ein Kontaktfarbbildsensor gemäß Anspruch 3 oder 4, in dem die Ausgangssignale der Sensorelemente der oberen Reihe (BPD11,RPD12,GPD12) über Leitungen, die zwischen den Sensorelementen der unteren Reihe (RPD11,GPD11,BPD12) angeordnet sind, zu den steuernden Schaltelementen (BQ11,RQ12,GQ12) geleitet werden.

6. Ein Kontaktfarbbildsensor gemäß einem der Ansprüche 1 bis 5, in dem die steuernden Schaltelemente (RQ11-RQmn,GQ11-GQmn,BQ11-BQmn) aus Dünnschichttransis-toren bestehen.

7. Ein Kontaktfarbbildsensor gemäß Anspruch 6, in dem die Drain-Elektroden der Dünnschichttransistoren (RQ11-RQmn,GQ11-GQmn,BQ11-BQmn) von einer Punktzelle gemeinsam über eine Datenlinie (DL1-DLn) mit der Signalausgabeeinrichtung verbunden sind (32).

8. Ein Kontaktfarbbildsensor gemäß einem der Ansprüche 1 bis 7, umfassend:

eine lineare Punktzellenanordnung, die aus Punktzellen zusammengesetzt ist (DS11-DSmn), wobei jedes der roten (RPD11-RPDmn), grünen (GPD11-GPDmn) und blauen (BPD11-BPDmn) Farbsensorelemente unter Bildung eines Dreiecks zweireihig angeordnet ist, zum Wahrnehmen von roten, grünen und blauen Farbkomponenten einer auf einem Punkt eines Dokumentes gedruckten Farbinformation, und Schaltelemente in Form von Dünnschichttransistoren (RQ11,GQ11,BQ11-RQmn,GQmn,BQmn), die jeweils mit den Sensorelementen verbunden sind, eines für jedes Sensorelement, zur selektiven Schaltung der Sensorelemente und zur Ausgabe der Ausgabesignale der roten, grünen und blauen Farb-sensorelemente, wobei jedes der Schaltelemente eine Gate-, eine Drain- und Source-Elektrode aufweist, und in dem die Punktzellenanordnung in m Gruppen aus n Punktzellen aufgeteilt ist;

- eine Mehrzahl von mit den Gate-Elektroden der Dünn-schichttransistor-Schaltelemente verbundenen Gatelinien (ADR1,ADB1,ADG1-ADRm,ADBm,ADGm), die jeweils mit dem Sensorelement derselben Farbe in der Gruppe verbunden sind;
- eine Mehrzahl von mit den Drain-Elektroden der Dünnschichttransistor-Schaltelemente verbundenen Drain-linien (DL1-DLn), wobei jede der Drainlinien aus drei der roten, grünen und blauen Sensorelemente besteht und in jeder der Gruppen gemeinsam verwendet wird;
- Ansteuereinrichtung (30) zum sequentiellen Ansteuern der Dünnschichttransistor-Schaltelemente, wobei die Gate-Linien (ADR1,ADB1, ADG1-ADRm,ADBm,ADGm) mit der Ansteuereinrichtung verbunden sind; und
- eine Signalausgabeeimrichtung (32) zum Lesen eines Signals von den Drain-Elektroden, wobei die Drainlinien (DL1-DLn) mit der Signalausgabeeinrichtung verbunden sind.

9. Ein Kontaktfarbbildsensor gemäß Anspruch 8, in dem die Sensorelemente aus Photodioden bestehen.

10. Ein Kontaktfarbbildsensor gemäß Anspruch 8 oder 9, in dem die Source-Elektroden der Dünnschichttransistor-Schaltelemente (RQ11-RQmn,GQ11-GQmn,BQ11-BQmn) jeweils mit den Photodioden (RPD11-RPDmn,GPD11-GPDmn,BPD11-BPDmn) verbunden sind.

11. Ein Kontaktfarbbildsensor gemäß Anspruch 10, in dem die zwei Reihen Punktzellen Photodioden der oberen Reihe und Photodioden der unteren Reihe umfassen, wobei die Photodioden der oberen Reihe (BPD11,RPD12,GPD12) mit den Source-Elektroden der Dünnschichttransistor-Schalt-elemente (BQ11,RQ12,GQ12) über zwischen den Photodioden der unteren Reihe (RPD11,GPD11,BPD12) ausgebildeten Linien verbunden ist.

12. Ein Verfahren zur Herstellung von Kontaktfarbbildsensoren, umfassend die Schritte von:

- Vorlegen eines Substrats (40);
- Bilden einer Mehrzahl von Photodioden (BPD, RPD,GPD) die mit einer Mehrzahl von Anoden (42), Schichten aus lichtempfänglichem Material (44) und transparenten Elektroden (45) beschichtet sind, und einer Mehrzahl von Dünnschichttransistoren (RQ,BQ,GQ) zum Ansteuern der Photodioden, auf dem Substrat:
- Bilden einer isolierenden Schicht auf den transparenten Elektroden (45);
- Bilden von durchgehenden Löchern auf der isolierenden Schicht (45), und Bilden von Leitungen, um die Mehrzahl von transparenten Elektroden (45) jeweils mit den Source-Elektroden der Mehrzahl von Dünnschicht-transistoren über die durchgehenden Löcher zu verbinden;
- Beschichten der Leitungen und der isolierenden Schicht mit einem Schutzfilm (46);

gekennzeichnet dadurch, daß

- rote, grüne und blaue Filter (47,48,49) ausgebildet werden, indem Bereiche des Schutzfilms (46), in denen die transparenten Elektroden (45) angeordnet sind, in rote, grüne und blaue Farben gefärbt werden;
- die Photodioden abwechselnd in zwei Reihen angeordnet sind;
- die Photodioden für die rote Farbe (RPD11) und die grüne Farbe (GPD11) und die blaue Farbe (BPD11) einer Punktzelle ein Dreieck bilden, und die Photodioden für die rote Farbe (RPD12) für die grüne Farbe (GPD12), und die blaue Farbe (BPD12) einer Nachbarspunktzelle ein inverses Dreieck bilden;

und daß die roten, grünen und blauen Farbfilter unter Bildung eines Dreiecks so angordnet sind, wobei das von den roten, grünen und blauen Farbfiltern gebildete Dreieck dem des von den benachbarten roten, grünen und blauen Farbfilter gebildeten Dreieck invers ist.

13. Ein Verfahren gemäß Anspruch 12, in dem die Leitungen zum Verbinden der transparenten Elektroden der in der oberen Reihe angeordneten Photodioden mit den Dünnschichttransistoren zwischen den transparenten Elektroden der in der unteren Reihe angeordneten Photodioden positioniert sind.

14. Ein Verfahren gemäß Anspruch 12 oder 13, in dem das lichtempfängliche Material aus amorphem Silizium besteht.

15. Ein Verfahren gemäß einem der Ansprüche 12 bis 14, umfassend die Schritte:

- Vorlegen eines Glassubstrats (40);
- Bilden einer Bildsensorvorrichtung, umfassend eine lineare Punktzellenanordnung mit einer Mehrzahl von linear angeordneten Punktzellen (DS11-DSmn), wobei jede Zelle rote (RPD11-RPDmn), grüne (GPD11-GPDmn) und blaue (BPD11-BPDmn) Farbsensorelemente aufweist, die unter Bildung eines Dreiecks in zwei Reihen angeordnet sind, jedes Sensorelement eine Photodiode umfasst und eine Mehrzahl von Dünnschichttransistoren (RQ11, GQ11,BQ11-RQmn,GQmn,BQmn) zur Ansteuerung der Photodioden, einen für jede Pho-

todiode, auf dem Substrat;

- Bilden einer Passivationsschicht aus Polyimid (46) auf der gesamten Oberfläche der Farbsensorvorrichtung, und
- Bilden von roten, grünen und blauen Filtern durch Färben von Bereichen der Passivationsschicht aus Polyimid in denen die transparenten Elektroden angeordnet sind, in rote, grüne und blaue Farben.

Revendications

1. Un capteur d'image en couleurs par contact comprenant :

   un agencement de cellules ponctuelles composé de cellules ponctuelles (DS11-DSmn) munies d'éléments capteurs (BPD, RPD, GPD) et d'éléments de commutation (RQ, BQ, GQ);
   des moyens de sortie de signaux (32) pour capter des signaux émis à partir de cellules ponctuelles (DS11-DSmn) dudit agencement de cellules ponctuelles, afin de les transformer en données numériques; et
   des moyens d'actionnement ou de pilotage (30) pour actionner lesdits éléments de commutation de commande,

   caractérisé en ce que

   chaque cellule ponctuelle (DS11-DSmn) comporte des éléments capteurs de la couleur rouge (RPD11-RDPmn), verte (GPD11-GDPmn) et bleue (BPD11-BDPmn) pour capter les composantes de couleurs rouge, verte, bleue, de l'information de couleurs imprimée sur un point d'un document, et trois éléments de commutation de commande (RQ11, GQ11, BQ11 - RQmn, GQmn, BQmn) respectivement reliés auxdits éléments capteurs, pour émettre sélectivement des signaux de sortie desdits éléments capteurs de couleurs rouge, verte et bleue; lesdits éléments capteurs de couleurs rouge, verte et bleue de chaque cellule ponctuelle forment un triangle, le triangle d'une cellule étant inverse par rapport au triangle de la cellule voisine;
   lesdits moyens de sortie de signaux (32) traitent les signaux capteurs de composantes de couleurs rouge, verte, et bleue fournies par les cellules ponctuelles dudit agencement de cellules ponctuelles, afin de les transformer en données numériques; et
   lesdits moyens d'actionnement (30) actionnent lesdits éléments de commutation de commande (RQ11-RQmn, GQ11-GQmn, BQ11-BQmn) en fonction d'une composante de couleurs des éléments capteurs de composants de couleurs.

2. Un capteur d'image en couleurs par contact selon la revendication 1, dans lequel les signaux de sortie des trois éléments de commutation de commande (RQ11, GQ11, BQ11 - RQmn GQmn, BQmn) de chaque cellule sont reliés en commun à une ligne de données (DL1-DLn) auxdits moyens de sortie de signal (32).

3. Un capteur d'image en couleurs par contact selon la revendication 1 ou 2, dans lequel lesdits éléments capteurs de couleurs rouge, verte et bleue (RPD11-RDPmn, GPD11-GDPmn, BPD11-BDPmn) sont agencés en deux rangées.

4. Un capteur d'image en couleurs par contact selon la revendication 1, 2 ou 3, dans lequel lesdits éléments capteurs (RPD11-RDPmn, GPD11-GDPmn, BPD11-BDPmn) sont constitués par des photodiodes.

5. Un capteur d'image en couleurs par contact selon la revendication 3 ou 4, dans lequel les signaux de sortie desdits éléments capteur de la rangée supérieure (BPD11, RPD12, GPD12) sont transmis auxdits éléments de commutation de commande (BQ11, RQ12, GQ12) par des fils formés entre lesdits éléments capteurs agencés dans la rangée inférieure (RPD11, GPD11, BPD12).

6. Un capteur d'image en couleurs par contact selon l'une des revendications 1 à 5, dans lequel lesdits éléments de commutation de commande (RQ11-RQmn, GQ11-GQmn, BQ11-BQmn) sont constitués par des transistors en couches minces.

7. Un capteur d'image en couleurs par contact selon la revendication 6, dans lequel lesdites électrodes de drain desdits transistors en couches minces (RQ11-RQmn, GQ11-GQmn, BQ11-BQmn) d'une cellule ponctuelle sont reliés en commun à une ligne de données (DL1-DLn) auxdits moyens de sortie de signaux (32).

8. Un capteur d'image en couleurs par contact selon l'une des revendications 1 ou 7, comprenant

   un agencement linéaire de cellules ponctuelles composé de cellules ponctuelles (DS11-DSmn) comportant chacune des éléments capteurs de la couleur rouge (RPD11-RDPmn), verte (GPV11-GDPmn) et bleue (BPD11-BDPmn) agencés en deux rangées, formant un triangle pour capter les composantes de couleurs rouge, verte et bleue de l'information de couleur à imprimer sur un point d'un document, et des éléments de commutation de

transistor en couche mince (RQ11, GQ11, BQ11 - RQmn, GQmn, BQmn) respectivement reliés auxdits éléments capteurs, un pour chacun desdits éléments capteurs, pour commuter sélectivement chacun desdits éléments capteurs et pour émettre en sortie des signaux de sortie desdits éléments capteurs de couleurs rouge, verte et bleue, chacun desdits éléments de commutation comportant des électrodes de grille, de drain et de source, et dans lequel ledit *agencement de cellules ponctuelles est divisé* en m groupes de n cellules ponctuelles;
une pluralité de lignes de grille (ADR1, ADB1, ABG1 - ADRm, ADBm, ADGm) reliées auxdites électrodes de grille desdits éléments de commutation à transistor en couche mince qui sont reliés audit élément capteur de la même couleur dans ledit groupe, respectivement;
une pluralité de lignes de drain (DL1 - DLn) reliées auxdites électrodes de drain desdits éléments de commutation à transistor en couche mince, chacune desdites lignes de drain se composant de trois éléments capteurs rouges, *verts et bleus et étant communément utilisés* dans chacun desdits groupes;
des moyens d'actionnement (30) pour actionner ou piloter séquentiellement lesdits éléments de commutation à transistors en couche mince, lesdites lignes de grille (ADR1, ADB1, ADG1 - ADRm, ADBm, ADGm) étant reliées auxdits moyens d'actionnement; et
des moyens de sortie de signaux (32) pour lire un signal en provenance desdites électrodes de drain, *lesdites lignes de drain (DL1 - DLn)* étant reliées auxdits moyens de sortie de signaux.

9. Un capteur d'image en couleurs par contact selon la revendication 8, dans lequel lesdits éléments capteurs sont constitués par des photodiodes.

10. Un capteur d'image en couleurs par contact selon la revendication 8 ou 9, dans lequel lesdites électrodes de source desdits éléments capteurs à transistor en couche mince (RQ11-RQmn, GQ11-GQmn, BQ11-BQmn) sont reliés respectivement *auxdites photodiodes* (RPD11-RDPmn, GPD11-GDPmn, BPD11-BDPmn).

11. *Un capteur d'image en couleurs par contact selon* la revendication 10, dans lequel lesdites deux rangées de cellules ponctuelles comportent des photodiodes de rangée supérieure et des photodiodes de rangée inférieure, dans lequel lesdites photodiodes de rangée supérieure (BPD11, RPD12, GPD12) sont reliées auxdites électrodes de source desdits éléments de commutation à transistor en couche mince (BQ11, RQ12, GQ12) par des lignes formées entre lesdites photodiodes de rangée inférieure (RPD11, GPD11, BPD12).

12. Un procédé de fabrication d'un capteur d'image en couleurs par contact comprenant les étapes consistant

à disposer un substrat (40);
à former sur ledit substrat une pluralité de photodiodes (BPD, RPD, GPD) sur lesquelles sont *stratifiées une pluralité d'électrodes d'anode* (42), deux couches (44) d'un matériau recevant la lumière et d'électrodes transparentes (45), et une pluralité de transistors en couche mince (RQ, BQ, GQ) pour piloter lesdites photodiodes;
à former un film isolant sur lesdites électrodes transparentes (45);
à former des trous de passage sur ledit film isolant (45), et à mettre en place des fils pour relier respectivement ladite *pluralité d'électrodes* transparentes (45) aux électrodes de source de ladite pluralité de transistors en couche mince, *via lesdits trous de passage;*
à revêtir ledit fil et ledit film isolant d'un film de protection (46);

caractérisé en ce que l'on forme des filtres rouges, verts et bleus (47, 48, 49) par coloration des zones dudit film de protection (46) où sont disposées lesdites électrodes transparentes (45), dans des couleurs rouges, vertes et bleues;

*en ce que lesdites photodiodes sont alternati*vement disposées en deux rangées;
en ce que les photodiodes pour la couleur rouge (RPD11), pour la couleur verte (GPD11), et pour la couleur bleue (BPD11) d'une cellule ponctuelle forment un triangle, les photodiodes pour la couleur rouge (RPD12), pour la couleur verte (GPD12) et pour la couleur bleue (BPD12) d'une cellule ponctuelle voisine formant un triangle inverse;
et en ce que lesdits filtres pour la couleur rouge, verte et bleue sont agencés pour former un triangle, le triangle formé par les filtres de couleurs *rouge, verte et bleue étant inversé par* rapport au triangle formé par les filtres de couleurs rouge, verte et bleue voisins.

13. Un procédé selon la revendication 12, dans lequel lesdits fils pour relier les électrodes transparentes desdites photodiodes agencées à rangée supérieure auxdits transistors en couche mince sont disposés entre les électrodes transparentes desdites photodiodes agencées en rangée inférieure.

14. Un procédé selon la revendication 12 ou 13, dans

lequel ledit matériau recevant la lumière est constitué de silice amorphe.

15. Un procédé selon l'une des revendications 12 à 14, comprenant les étapes consistant

à disposer un substrat en verre (40);
à former un dispositif capteur d'image comprenant un agencement linéaire de cellules ponctuelles comprenant une pluralité de cellules *ponctuelles (DS11 - DSmn) agencée linéaire*ment, chaque cellule comportant des éléments capteurs de couleurs rouge (RPD11 - RPDmn), verte (GPD11 - GPDmn) et bleue (BPD11 - BPDmn) agencés en deux rangées, à former un triangle, chaque élément capteur comprenant une photodiode, et une pluralité de transistors en couche mince (RQ11, GQ11, BQ11 - RQmn, GQmn, BQmn) pour piloter lesdites photodiodes, un pour chaque photodiode, sur ledit substrat;
à former un film de passivation polyimide (46) sur la totalité de la surface dudit dispositif capteur d'image; et
à former des filtres rouges, verts et bleus par coloration des zones (47, 48, 49) dudit film de passivation polyimide, là où lesdites électrodes transparentes sont disposées dans des couleurs rouge, verte et bleue.

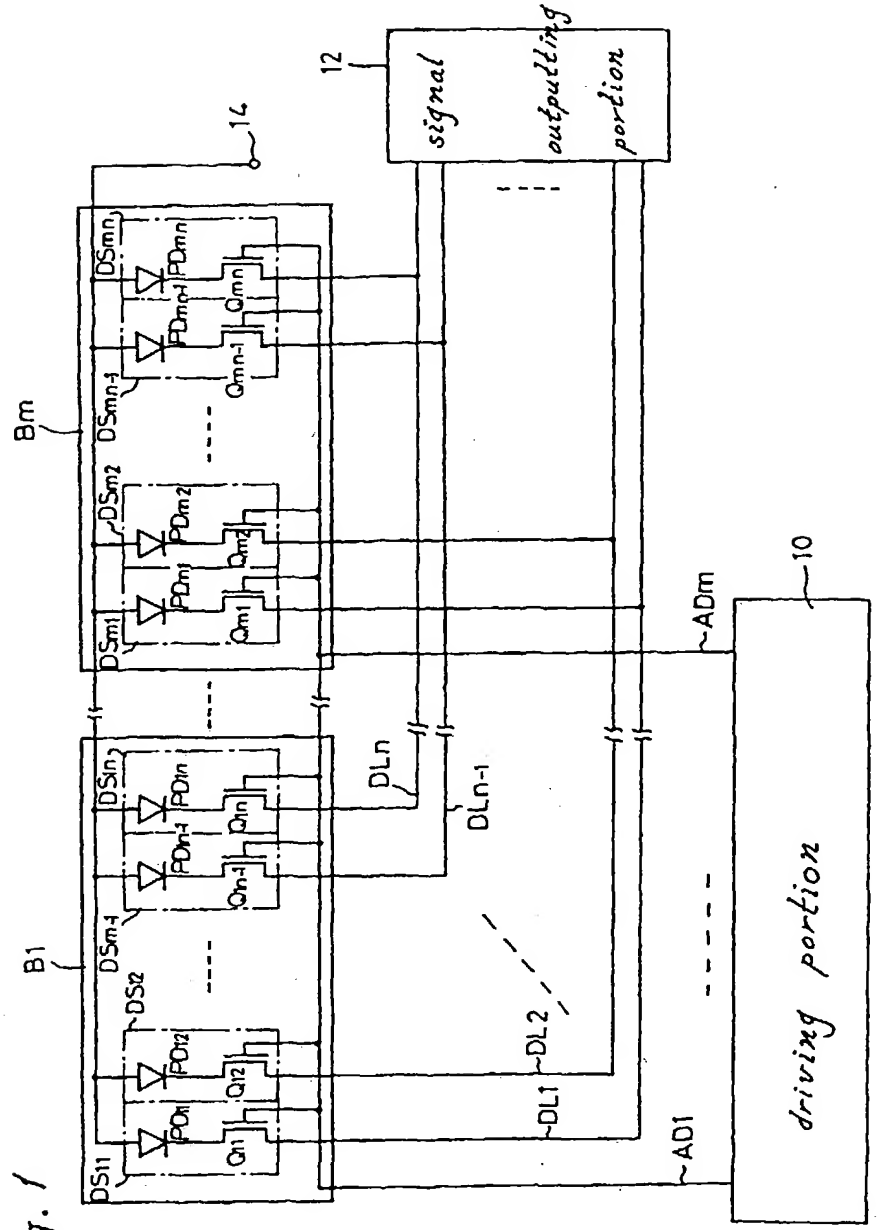

12
signal outputting portion
14
Bm
B1
DSmn
PDmn
Qmn
DSm2
PDm2
Qm2
DSm1
PDm1
Qm1
DSin
PDin
Qin
DSi2
PDi2
Qi2
DSi1
PDi1
Qi1
DLn
DLn-1
DL2
DL1
ADm
AD1
10
driving portion

Fig. 1

Fig. 2

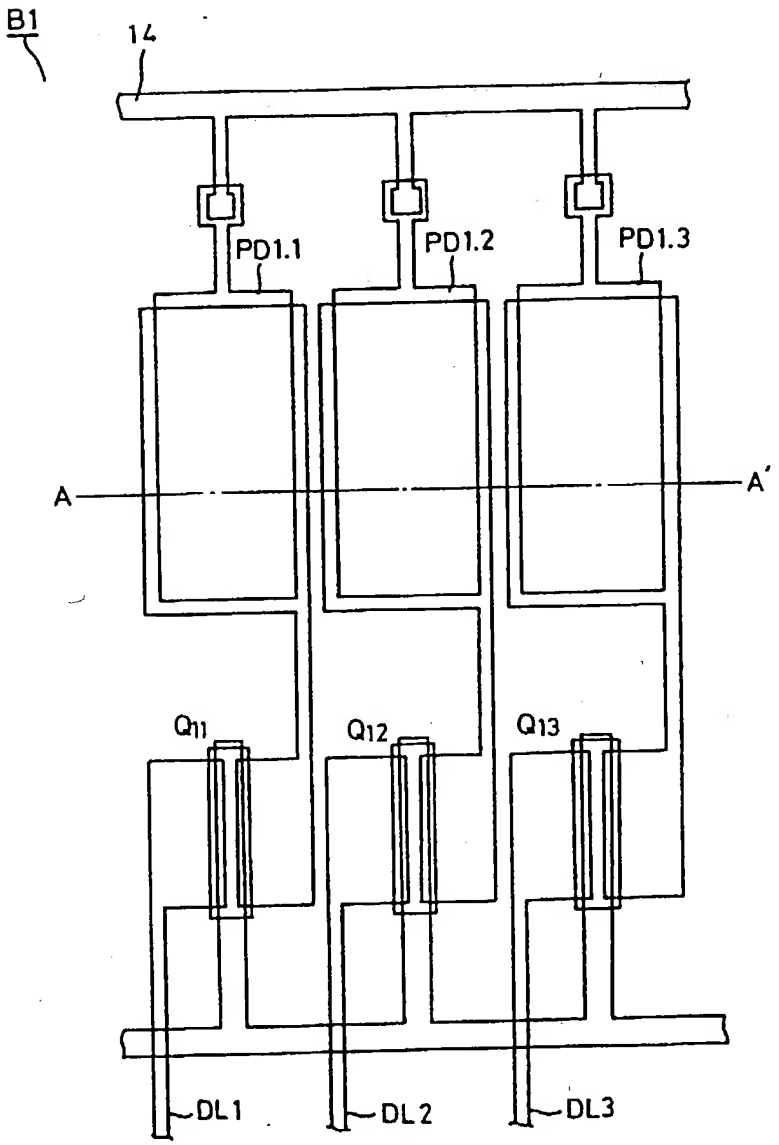


Fig. 3

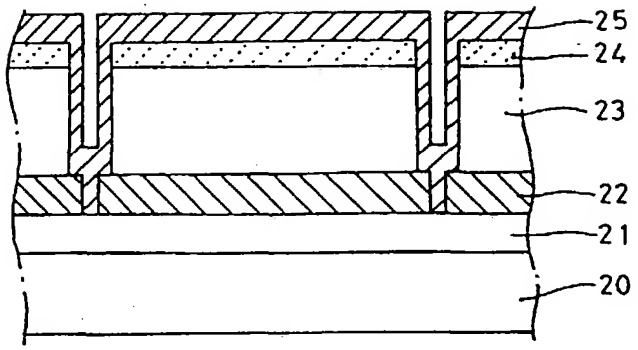
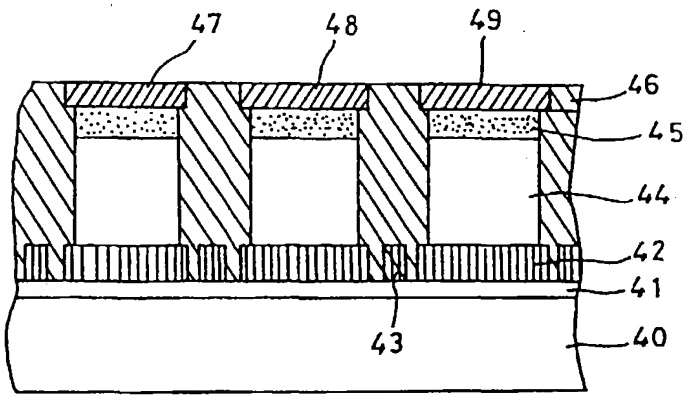


Fig. 6



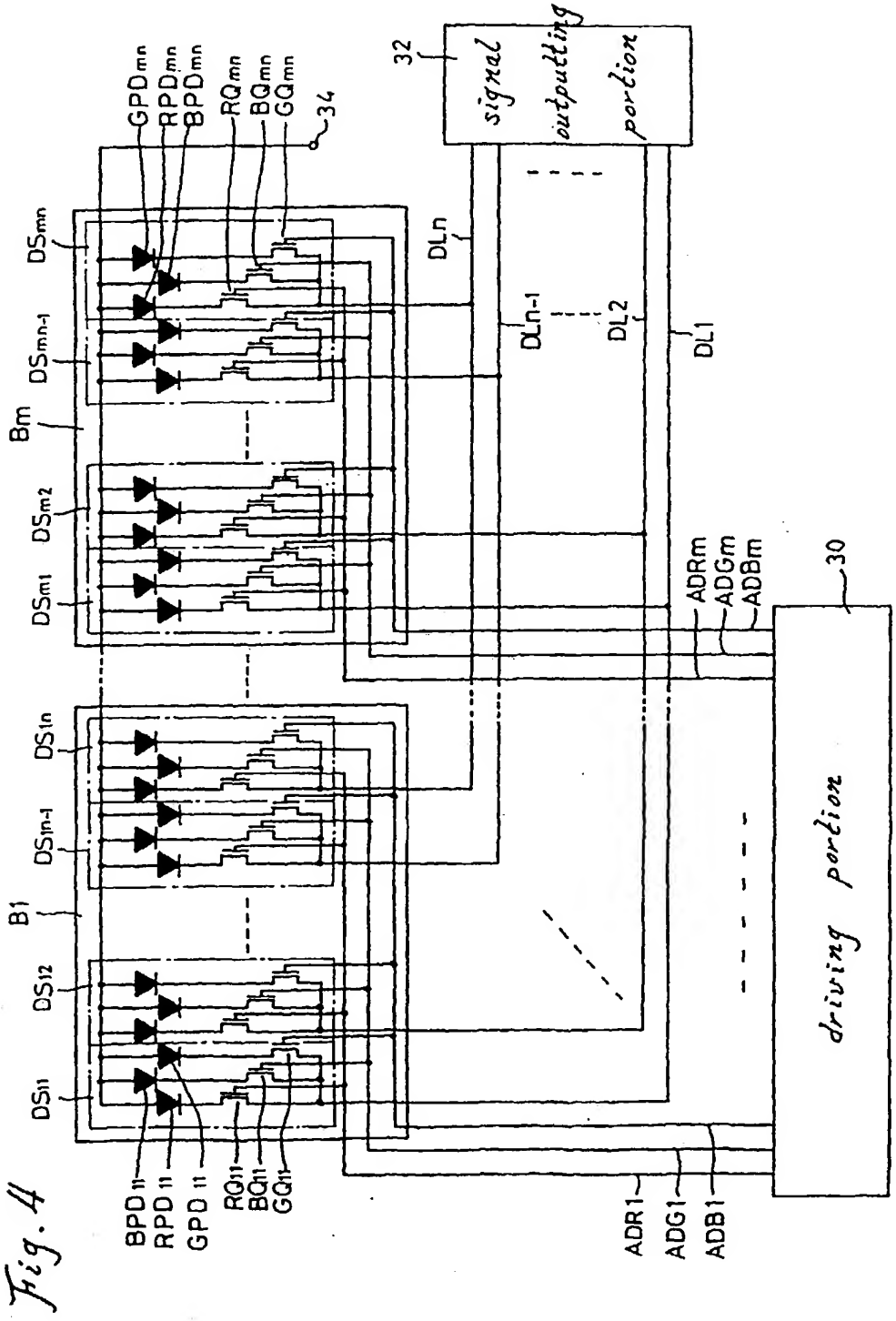
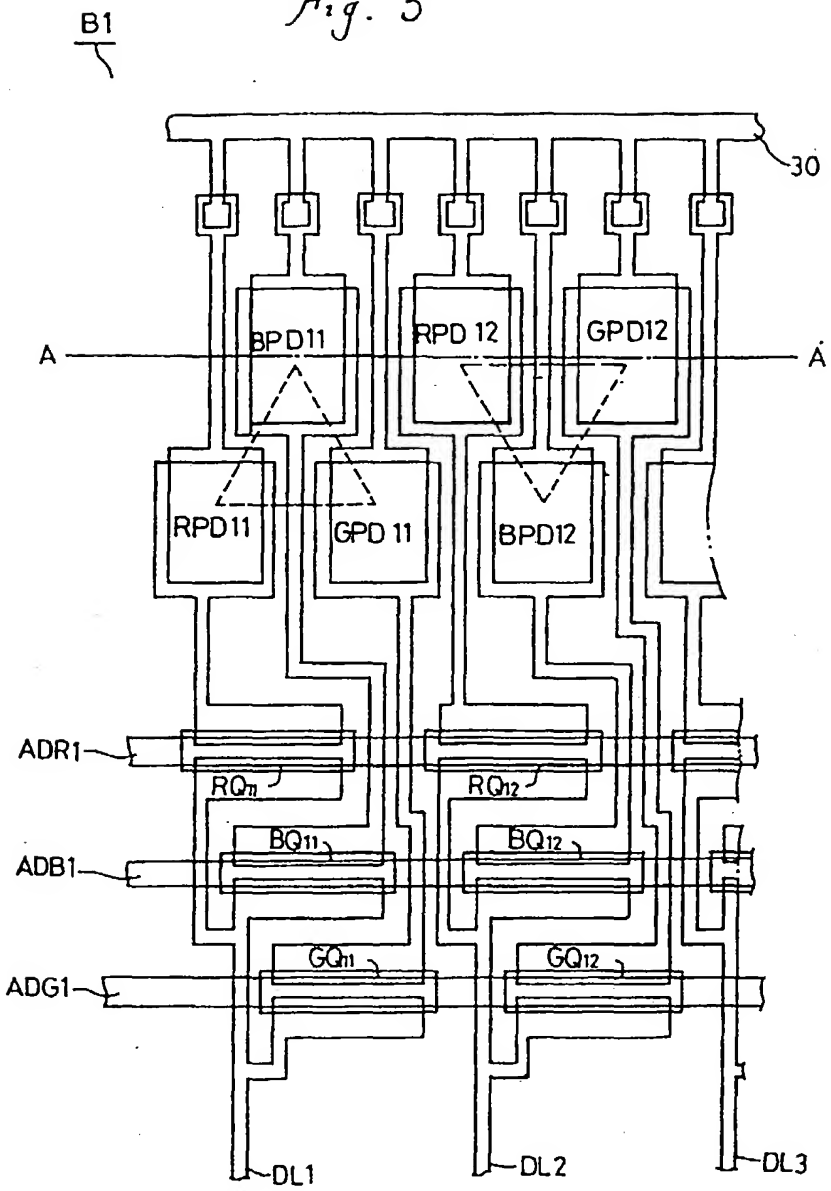

signal outputting portion
32
driving portion
30
GPDmn
RPDmn
BPDmn
RQmn
BQmn
GQmn
34
DSmn
DSm(n-1)
Bm
DSm2
DSm1
DSin
DSi(n-1)
B1
DSi2
DSi1
DLn
DLn-1
DL2
DL1
ADRm
ADGm
ADBm
BPD11
RPD11
GPD11
RQ11
BQ11
GQ11
ADR1
ADG1
ADB1

Fig. 4

Fig. 5


B1
30
A
A'
BPD11
RPD 12
GPD12
RPD11
GPD 11
BPD12
ADR1
RQ11
RQ12
ADB1
BQ11
BQ12
ADG1
GQ11
GQ12
DL1
DL2
DL3